VITALIY GYRYA

CURRICULUM VITAE

Business Address:

T-5 Group, Mail Stop B-284 Phone: (973) 865-1226
Applied Mathematics and Plasma Physics,
Los Alamos National Laboratory E-mail: vitaliy_gyrya@lanl.gov
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Research Interests:

Partial Differential Equations (PDEs); Calculus of Variations; Homogenization; Numerical methods for PDEs; Fluid dynamics; Modeling of biological systems

Education:

Ph.D. Applied Mathematics, Penn State, 2010
Advisor: *Leonid Berlyand*

M.S. Applied Mathematics, University of Akron, 2005
Advisor: *Dmitry Golovaty*

B.A. Applied Mathematics & **B.A.** Computer Science, Rutgers, 2003

Computational and Programming Experience

MatLab, Mathematica, C/C++, Fortran, Java, version control system (SVN), LaTex, HTML.

Selected Honors, Awards, and Certificates

2008	Teaching Associate
2001	Certified Java Developer, Sun Microsystems
2001	Certified Java Programmer, Sun Microsystems
2000	John Bogart Prize
1998–2000	Member of the 3-student team that represented Rutgers University in the Putnam Examination. Made top 200 (out of ∼3000 nationwide, 1999).
1995	Two 1st degree diplomas in the International Mathematical Tournament of Towns (Novi Sad, Yugoslavia) in the problems of "Coloring" and "Reversal sorting".
1996	2nd degree diploma at the All-Ukrainian Mathematical Olympiad.
1995	3rd degree diploma at the All-Ukrainian Mathematical Olympiad.

Employment History:

09/2010-present	*Postdoc*, T-5, Applied Mathematics and Plasma Physics Los Alamos National Laboratory, Los Alamos, NM.
08/2005-08/2010	*Graduate Teaching and Research Assistant* Department of Mathematics, Penn State University State College, PA.

Employment History (continued):

06/2008-08/2008 and 06/2007-08/2007 — *Graduate Research Assistant*
T-7 Group (now T-5), Mathematical Modeling and Analysis,
Theoretical Division, Los Alamos National Laboratory,
Los Alamos, NM

06/2006-08/2006 — *Graduate Research Assistant*
Mathematics and Computer Science Division
Argonne National Laboratory, Argonne, IL

08/2003-08/2005 — *Graduate Teaching and Research Assistant*
Department of Theoretical and Applied Mathematics
The University of Akron, Akron, OH

Research Experience:

09/2010-present — *Postdoc*
T-5, applied Mathematics and Plasma Physics
Los Alamos National Laboratory, Los Alamos, NM.
Development and analysis of numerical methods (Mimetic Finite Difference) for the wave equations with the goal of producing computationally efficient and accurate methods.

08/2005-08/2010 — *Graduate Teaching and Research Assistant*
Department of Mathematics,
Penn State University, State College, PA.
Performed the modeling and the analysis (asymptotical and numerical) of the dynamics of microswimmers (low Reynolds number, e.g. self-propelled bacteria) due to hydrodynamic interactions. Demonstrated well posedness of the models. Numerically analyzed the dependence of the effective shear viscosity of the suspension of microswimmers in the fluid on the propulsion strength of the microswimmers.

06/2008-08/2008 — *Graduate Research Assistant*
Mathematical Modeling and Analysis Group, Theoretical Division,
Los Alamos National Laboratory, Los Alamos, NM.
Developed and implemented a new numerical method (Mimetic Finite Difference method) for the incompressible Stokes equation (to resolve the motion of fluid on a microscale).

Applied the method to estimate the effective viscosity for a suspension of microswimmers (e.g. self-propelled bacteria).
The results published in the Journal of Mathematical Biology, published in the Journal of Computational Physics and presented at the University of New Mexico, 8th Annual Student Symposium.

Research Experience (continued):

06/2007-08/2007 *Graduate Research Assistant*
Mathematical Modeling and Analysis Group, Theoretical Division,
Los Alamos National Laboratory, Los Alamos, NM.
Developed and implemented a new numerical method (higher-order Mimetic Finite Difference method) for diffusion equation.
The results published in the Journal of Computational Physics.

06/2006-08/2006 *Graduate Research Assistant*
Mathematics and Computer Science Division,
Argonne National Laboratory, Argonne, IL.
Modeled the motion of microswimmers (e.g. bacteria) in a fluid.

Analyzed the dynamics of microswimmers as a function of the location of the propulsion apparatus. Critical dependence is observed.
The results published in the Bulletin of Mathematical Biology and presented at the Society of Engineering Science-2008 conference.

08/2003-08/2005 *Graduate Teaching and Research Assistant*
Department of Theoretical and Applied Mathematics,
The University of Akron, Akron, OH.
Numerical analysis of the propagating polymerization front.
The results published in Physica D.

Scientific Presentations

1. "Adaptation of Mimetic Finite Difference discretization to reducing numerical dispersion in wave equation", International Conference on Mathematical and Numerical Aspects of Waves, *Simon Fraser University*, Vancouver, BC, Canada, July 2011.
2. "Effective shear viscosity of suspensions of micro-swimmers from small to moderate concentrations", Annual Technical Meeting of Society of Engineering Science, *Iowa State University* at *Ames*, IA, October 2010.
3. "Suspensions of microswimmers at small and moderate concentrations: effective shear viscosity and dynamics", Workshop on Self-Organization and Multi-Scale Mathematical Modeling of Active Biological Systems, *SAMSI*, NC, October 2009 and Workshop on Interdisciplinary Mathematics, *Penn State*, PA, May 2010.
4. "Asymptotic and numerical analysis of PDE models for suspensions of micro-swimmers: interaction and effective viscosity", *CCMA Luncheon Seminar*, Department of Mathematics, *Penn State*, PA, October 2009.
5. "The new Mimetic Finite Difference method for stationary Stokes equation with applications to bacterial suspensions", Applied Math Days, Department of Mathematical Sciences, *Rensselaer Polytechnic Institute*, NY, November 2008.
6. "A model of hydrodynamic interaction between self-propelled bacteria", Annual Technical Meeting of Society of Engineering Science, *University of Illinois* at *Urbana-Champaign*, IL, October 2008.

7. "New Mimetic Finite Difference Method for stationary Stokes equation", 8-th Annual Student Symposium, *University of New Mexico*, Los Alamos, NM, August 2008.
8. "New high-order Mimetic Finite Difference discretization for diffusion problems", *Los Aalamos National Laboratory*, NM, July 2007.

Peer reviewed publications

1. "Effective shear viscosity and dynamics of suspensions of micro-swimmers from small to moderate concentrations", V. Gyrya, K. Lipnikov, I. Aronson, L. Berlyand, *Journal of Mathematical Biology*, DOI 10.1007/s00285-010-0351-y (2010)
2. "Mimetic finite difference method for the Stokes problem on polygonal meshes" L. Beirão da Veiga, V. Gyrya, G. Manzini, and K. Lipnikov, *Journal of Computational Physics*, vol. 228, no. 19, pp. 7215-7232 (2009).
3. "High-order mimetic finite difference method for diffusion problems on polygonal meshes" V. Gyrya and K. Lipnikov, *Journal of Computational Physics*, vol. 227, n.20, pp. 8841-8854 (2008).
4. "A model of hydrodynamic interaction between swimming bacteria" V. Gyrya, L. Berlyand, I. Aranson, and D. Karpeev, *Bulletin of Mathematical Biology*, published online (2009).
5. "A Numerical Study of One-Step Models of Polymerization: Frontal vs. Bulk Mode" with S.A. Cardarelli, D. Golovaty, L.K. Gross, V. Gyrya, and J. Zhu, *Physica D*, 206 (3-4), pp. 145-165 (2005).

Academic Activities

1. *Extensive teaching experience:* Taught *twelve classes* in mathematics for engineering and general education students in Penn State and The University of Akron. (Teaching Associate since 2008).
2. *Mentored undergraduate students*: Alan Samuel Slipak (summer, 2008), Courtney Lea Jones (summer, 2007).